

Appendix D

**Acquisition Execution Plan
for
The BNL Center for Functional Nanomaterials**

At
Brookhaven National Laboratory
Upton, New York 11973

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BNL CENTER FOR FUNCTIONAL NANOMATERIALS ACQUISITION EXECUTION PLAN

A. Project Background and Objectives

1. Project Background

The mission of the Basic Energy Sciences (BES) program – a multipurpose, scientific research effort – is to foster and support fundamental research in focused areas of the natural sciences in order to expand the scientific foundations for new and improved energy technologies and for understanding and mitigating the environmental impacts of energy use. As part of its mission, the BES program plans, constructs, and operates major scientific user facilities to serve researchers at universities, national laboratories, and industrial laboratories.

In fulfilling its mission, the BES program has taken the lead within the Department of Energy (DOE) in the National Nanotechnology Initiative (NNI). The research plan for the NNI was developed by the Interagency Working Group on Nanotechnology, committee of the National Science and Technology Council. In a similar timeframe, the BES program issued a report “Nanoscale Science, Engineering and Technology Directions” (referred to as NSET). Both the NNI and the BES NSET reports recommended the initiation of Nanoscale Science Research Centers (NSRCs), which were deemed essential for conducting research in support of the DOE missions. The Center for Functional Nanomaterials (CFN) at Brookhaven National Laboratory (BNL), the only NSRC proposed for the Northeastern United States, is a cornerstone of these NNI and BES program plans. This NSRC and all others were chosen by external peer review, were vetted by the Basic Energy Sciences Advisory Committee, and will receive continuing review as the science themes mature and as construction proceeds. The mission need was approved in June 2002 and the current scope has not changed since that time.

Outstanding facilities exist for the characterization and analysis of materials at the nanoscale. Within the U.S., most of these world-class facilities are owned and operated by the BES program. They include, for example, the synchrotron radiation light source facilities, the neutron scattering facilities, the electron beam microscope centers, and other specialized facilities. BNL is home to the National Synchrotron Light Source (NSLS), the Laser Electron Acceleration Facility (LEAF), and advanced electron beam microcharacterization instrumentation.

However, world-class facilities that are widely available to the scientific research community for nanoscale synthesis, processing, fabrication; for proximal probe imaging; and for studying temporal dynamics do not exist. NSRCs fill that need by serving the Nation’s researchers and complementing university and industrial capabilities in the tradition of BES user facilities and collaborative research centers. NSRCs will build on the existing research and facility strengths of the host institutions in materials science and chemistry research and in x-ray and neutron scattering. This powerful combination of

collocated nanoscale research, fabrication, and characterization tools will provide an invaluable resource for the Nation.

The remarkable change in properties of a material when it is structured on the nanoscale is driving a revolution in materials science. In addition, the ability to “nanostructure” materials offers potentially novel – and enhanced – materials properties in a form that immediately lends itself to making new basic building blocks for nanodevices that use these enhanced properties. NSRCs are important because the impact of nanoscience discoveries will depend on being able to link across multiple length and complexity scales. This linking from molecular interactions to nanostructures to functional systems is a challenge of the first order, both scientifically and technologically. Emerging approaches of lithography and replication extend to 50 nanometers, providing the opportunity to form a seamless integration of nano- and microtechnology. Bringing together the broad range of processing tools, characterization equipment, and technical expertise needed to span these length scales is a significant challenge. The NSRCs would also provide a unique environment to explore new nanoscience developments and allow students, faculty, industrial researchers, and national laboratory scientists to work together to propose, design, and assemble these materials into useful devices.

The overriding need is to provide an organizational infrastructure open to external users based on peer review that will focus a truly national nanomaterials effort, thereby enabling breakthrough opportunities. The NSRCs also provide a long-term commitment to solving significant research problems and to developing the expertise of a new generation of researchers in research at the nanoscale.

2. Project Objectives

The Center for Functional Nanomaterials will integrate BNL’s existing capabilities in its synchrotron characterization techniques, its LEAF electron source, and its growing electron imaging facilities with new materials synthesis, imaging, materials temporal probes, and nanofabrication capabilities. The scientific goal of the CFN is to understand the chemical and physical response of nanomaterials, with the challenge being to attain the level of understanding needed to tailor or design new classes of functional materials. The CFN’s programs will exploit the unique electronic and optical properties of nanoparticles and molecular nano-arrays to design chemical systems with specific functionality for diverse, energy-related applications such as catalysis, photo-induced energy conversion and storage, and molecular conductors. Another science emphasis will be to examine the behavior and fundamental properties of functional nanocomposite materials including ferro-electrics, magnetic and superconducting thin films to provide insights into their future applications. Still other emphasis have been documented in the Mission Need Statement. This capability and focus is complementary to the other planned NSRCs; it capitalizes on the National Synchrotron Light Source (NSLS) leadership in new materials probes; and it builds on the strengths of BNL’s BES programs in (1) strongly correlated electron systems, (2) catalysis, (3) molecular materials, (4) electrochemistry, and (5) nanostructure in complex functional materials.

In the CFN, a wide range of synthetic approaches will be explored to tune the photo or chemical activity and other properties of nanoscale objects through control of particle

size, density, molecular functionality, and chemical environment. In addition, the CFN will house an expanded electron microscopy facility, a nanopatterning capability, access to specialized NSLS beamlines, a powerful suite of unique proximal probes for directly imaging atomic and molecular structure, and ultrafast laser sources for nanomaterials excitation and probing, and a center for theory and modeling.

The physical structure of the Center will be a new building located contiguous to the existing NSLS and the BNL Instrumentation Division buildings. The CFN structure will be a two- story building housing clean rooms, wet and dry laboratories, office space for BNL staff and users, and seminar and conference rooms.

The CFN will operate through major laboratory clusters: including facilities for lithography-based nanofabrication, scanning probe and surface characterization, electron microscopy, materials synthesis and fabrication, ultrafast optical sources, theory and computation, and beamlines at the NSLS. An initial set of scientific equipment for these laboratories will be purchased as part of the project. The NSLS provides a wide range of imaging, spectroscopy, and diffraction/scattering techniques. To take advantage of these features, the CFN will have access to a suite of existing beamlines at the NSLS including: soft x-ray microscopy beamlines; UV, soft and hard x-ray spectroscopy beamlines; soft and hard x-ray scattering beamlines; an infrared spectro-microscopy beamline; an undulator insertion device microprobe beamline; and a wiggler insertion device small angle scattering beamline.

3. Applicable Conditions

There are no significant requirements for compatibility with existing systems or unusual cost, schedule, and performance constraints associated with this project. Where feasible, availability of the completed CFN should be expedited to support BES mission objectives.

4. Cost

The scope of this project includes design and construction of the CFN building, and procurement and installation of an initial set of specialized scientific equipment needed to support research activities. There will be state-of-the-art clean rooms as well as general wet and dry laboratories for sample preparation, fabrication, and analysis.

As stated in the Mission Need Statement for the CFN, this project has a preliminary Total Estimated Cost (TEC) range of \$70-\$85 million. The major elements of the TEC based on conceptual design are about \$8 million for design, inspection and project management, about \$29 million for construction, about \$33 million for technical equipment, and an estimated \$15 million for contingency.

For this stage of the project, there is reasonable confidence in these preliminary estimates because they were developed using a bottoms-up approach as part of the conceptual design process. The construction cost estimate is based on conceptual bills-of-materials prepared for each discipline as applied to R. S. Means estimating guide and BNL construction experience. Labor and material pricing is based on actual experience for

construction in the Long Island Area. Major material items are based on vendor quotes. The estimate for special equipment for technical construction is based on vendor quotes for each item and estimates for in-house labor to support procurement and installation.

Life-cycle cost – Although the total life-cycle cost has yet to be determined, it is possible to identify the components. The estimated life expectancy of the building is 40 years, while the operating lifetime for each piece of equipment in the building will vary and be determined at the time of purchase. The Annual Facility Operating Cost is estimated to be \$20 million (in FY 2007 dollars; exclusive of costs associated with the various research programs [Research equipment and research staff]). It is anticipated that additional scientific equipment will be procured during this 40-year period. Lastly, there are no radiation concerns or unusual decontamination requirements/costs associated with BNL activities at the CFN.

Design-to-cost – The AE firm will be required to design a building of approximately 85,000 gross square feet to meet a target construction cost of about \$29 million. Standard FAR Clauses requiring “Design Within Funding Limitations” and “Responsibility of the A/E” will be included in the A/E Subcontract to limit design costs.

Application of Should Cost Analysis – Although this effort does not have a single procurement with a detailed, special form of cost analysis as identified in Federal Acquisition Regulation 15.407-4, an extensive amount of “should cost” methodology was employed in preparing the TEC. The TEC has been developed as a bottoms-up detailed estimate using nationally recognized estimating guide methodology (R.S. Means), supplemented by vendor quotes and BNL construction experience on recent projects. The TEC breaks out the estimated program costs for the design, construction and equipment budgets, and each procurement will use some form of price or cost analysis to compare with the TEC estimates for validation. As a result, the TEC will serve as the “should cost” benchmarks as this project evolves. Cost estimates in the design, construction, and equipment are based on budgetary quotations from vendors or actual experiences from recent construction and supply contracts. These estimates will continue to be refined and analyzed as project development continues through Title I and Title II design.

5. Capability

The Center for Functional Nanomaterials will be a two-level structure of approximately 85,000 gross square feet. The building will incorporate human factors into its design so as to encourage peer interactions and collaborative visits by internal and external users. In addition to offices and laboratories, it will house “interaction areas” for informal discussions and scientific discourse. This design is commonly referred to as state-of-the-art in research facility design. The facility will contain wet and dry chemistry laboratories, clean rooms and will have special design features to address vibration isolation of sensitive equipment, shielding from electromagnetic forces, and sensitive temperature control. The specialized scientific equipment will provide capabilities for computation, synthesis, and sophisticated probes for characterizing new materials, e.g., catalysts, dielectrics, and organics.

6. Delivery Requirements

The Center for Functional Nanomaterials project is scheduled for completion and Beneficial Occupancy in 2007. Procurement of long lead instruments will begin in 2005. The facility design will be completed in 2004. Bid and award of the GC contract for the facility is in 2005. Incremental funding will be used to support the design, construction award and instrument procurement with approximately \$4 million in FY 2004 to initiate design, \$23 million in FY 2005 to complete design and initiate construction, \$43 million in FY 2006, and \$15 million in FY 2007. Major equipment procurements will start in FY 2005 and continue into FY 2007, with installation activities being accomplished by a combination of vendors supplying the equipment and BNL technical staff.

The following list is a schedule of key milestone dates for the CFN.

<u>Schedule</u>	<u>Start</u>	<u>Finish</u>
Title I	Jan 04	April 04
DOE CD-2 Approval	May 04	May 04
Title II Design	June 04	Nov 04
DOE CD-3 Approval	Dec 04	Dec 04
Procure Technical Equipment	Jan 05	Dec 06
General Building Construction	May 05	Dec 06
Install and Startup Equipment	Jan 07	Nov 07
DOE CD-4A Approval	Jan 07	Jan 07
DOE CD-4B Approval	Dec 07	Dec 07

Additional Milestones are listed in Attachment 1.

7. Trade-offs

Certain tradeoffs were analyzed in arriving at the acquisition strategy described in this plan. At the most fundamental level it is more efficient to rely on the operating contractor, BNL, to act as the prime contractor for the CFN project rather than have DOE serve in that capacity. BNL will have prime responsibility for oversight of all contracts required to execute this project. BNL has extensive experience at managing construction of research facilities of a complexity equal or greater than the proposed CFN. BNL's project management, construction management and ES&H management systems are all proven to be effective for oversight of projects of this scale and type.

Facility construction will be accomplished using the design-bid-build method. This proven approach provides direct control of the facility design and the General Contractor (GC) by the prime contractor, BNL.

BNL will oversee conventional facility design performance by an A/E firm. The first major contract will be with a competitively selected A/E firm to provide design services and later assist in construction management and inspection. The selection of the AE will

be based on technical qualifications. The decision to use an A/E firm was based on the following:

- Sufficient BNL design staff can not be dedicated to a project of this size without negatively impacting other construction programs
- A/E firms have more recent design experience with nanoscale research facilities
- Design by an AE and associated construction management support are at a slightly higher cost than if performed by BNL but are required to meet schedule and technical objectives.

BNL will specify, select and oversee procurement and installation of technical equipment. BNL's research staff is best suited to select and procure the technical equipment for the nanoscale research laboratories.

8. Risk

The risks associated with this project and acquisition strategy are judged to be reasonably low and acceptable. In a technical sense, the design and construction of the building are straightforward. This project consists of a laboratory/office building housing clean rooms and scientific equipment, which rely on proven technology. The instruments are commercially available (many are off-the-shelf and some will be built to customized specifications). The technical risks are low, and there is no research and development effort associated with the CFN. In addition, there are no operational constraints or safety, health and environmental issues that cannot be responsibly and economically addressed. BNL has a DOE-approved procurement system with established processes for handling A/E selection, construction management and equipment procurements.

9. Acquisition Streamlining

An architect engineer bidder's list is currently being developed; extensive interest has been expressed by many firms following the CFN workshop at BNL and the CD-0 announcement by Secretary Abraham. This has facilitated an expedited AE acquisition schedule.

Interested bidders for the general contractor role will be solicited during the design phase to assure a competitive pool of contractors for the bid phase.

The project scope includes some large instruments with long lead times of 1-2 years. For this reason, it is planned to order long lead items prior to the start of construction.

B. Plan of Action

1. Sources

Procurements for the Center for Functional Nanomaterials fall into the following categories:

- a. Architect/Engineer Design Services

- b. Construction
- c. Technical equipment

The Laboratory has established Basic Ordering Agreements with a number of full-service architect/engineering firms qualified to provide design services for this project. Since experience with nanocenter design is an important consideration, other A/E's will also be considered. The Long Island / New York region has a large number of qualified general contractors capable of constructing this project. The size of the project will attract a substantial number of bids. Technical equipment will be procured from a variety of sources, depending on the item.

2. Competition

Interested architect/engineer firms will submit SF 244/254 forms for evaluation by a selection committee appointed for that purpose. The Laboratory anticipates twenty or more proposals in response to RFPs for A/E services.

Lump sum construction bids will be solicited from general contractors in the New York / Long Island region. The value and scope of the project will attract a significant number of qualified bidders, insuring full and open competition.

Equipment will be procured from a variety of sources, depending on the item.

3. Source Selection Procedures

The selection process for Architect/Engineer will take approximately four (4) months and will begin in October 2002.

The bidding period for the general construction contract will take approximately six (6) weeks with two (2) weeks for award of contract.

In most cases, equipment will be competitively procured. Some sole source procurements of one-of-a-kind equipment will be necessary.

4. Contracting Considerations

The Laboratory will use the previously described selection process to select a qualified A/E and then negotiate a fixed fee. The A/E contract will be fixed fee based on a defined scope of work. The Laboratory has a long history of success obtaining A/E services under this type of contract.

The construction contract will be awarded to the lowest cost, qualified bidder. Each bidder will be required to complete a Qualification Criteria form, including references and confirming data, and submit it with their bid. The qualification criteria will establish requirements for technical competency and safety performance on past projects.

Value Engineering will be completed on the Title I design package by trained engineers and architects independent of the A/E contracted for design services.

Some of the large equipment will require installation and startup services as part of the original procurement. Contracts for installation of instruments will be incorporated in the instrument procurement contract where feasible and will be coordinated with the construction schedule to identify optimum delivery date for installation.

5. Budgeting and Funding

The line item funding profile indicated below is based on conceptual design, and budget numbers in the FY 2004 Center for Functional Nanomaterials Project Data Sheet, but may be modified to account for a \$1 million PED funding start in FY 2003.

	Budget Authority <u>(\$ in Millions)</u>
<u>Project Engineering and Design</u>	
FY 2004	4.1
FY 2005	1.4
<u>Construction & Procurement</u>	
FY 2005	21.5
FY 2006	42.8
FY 2007	<u>15.2</u>
<u>Total Estimated Cost Range</u>	\$70-\$85

The estimated \$15M of contingency in the TEC is distributed between Project Engineering and Design (\$1M) and Construction including technical equipment (\$14M).

The budget estimates were developed by the scientists, engineers and architects on the conceptual design project team.

6. Product Description

The conventional facility portion of the project will consist of designing and constructing a 2-story building totaling approximately 85,000 gross square feet. This facility will provide labs, offices, clean rooms, and equipment to perform the research described in Section 2. Project Objectives. Specifications and drawings will be developed by the Architect/Engineer based on performance specifications provided by the Laboratory. The construction of the facility will be based on the detailed design specifications developed by the A/E. Construction will utilize proven conventional methods with additional consideration given to structural requirements to isolate sources of vibration, architectural treatments to eliminate RF interference and HVAC systems to assure precise control of airflow, temperature and humidity in selected laboratories.

The technical equipment selected will support the thrust areas and research clusters defined in Section 2, Project Objectives. The selected equipment is expected to evolve as planning for the CFN scientific program continues with its future users at universities and

in industry. Equipment items are largely commercial off-the-shelf instruments and systems, although some modification will be necessary to meet specialized research needs.

7. Priorities, Allocations, and Allotments:

There are no unique priorities, allocations or allotments associated with procuring the Center for Functional Nanomaterials.

8. Contractor vs. Government Performance

All work associated with the Center for Functional Nanomaterials will be performed by contractor personnel. BNL will award all contracts to commercial firms, some of which will subcontract to additional commercial firms. There does not appear to be any advantage in DOE directly handling the CFN procurements, including design and construction.

9. Inherently Governmental Functions

There are no inherently governmental functions associated with the CFN.

10. Management Information Requirements

The Laboratory will submit monthly reports to the Federal Project Manager utilizing a DOE approved earned value performance management system. Reports will detail schedule progress, financial status and variance analysis (if any) in compliance with DOE Order 413.3, "Program and Project Management of Capital Assets". Data will also be input into the Project Assessment and Reporting Requirements System (PARS).

11. Make or Buy

BNL will buy all major aspects of the CFN project including building design, construction and equipment under its M&O contract with DOE. The rationale for this approach is described under Section 7, Trade-offs.

12. Test and Evaluation

Standard construction acceptance processes will be used for conventional construction. Additional consideration will be given to verify vibration resistant construction, RF shielding performance and precise HVAC system performance. Test and acceptance procedures for equipment will be defined in the individual procurement specifications for each item based on the needs of the specific laboratory and manufacturer's recommendations. Clean rooms will be tested in accordance with industry standards based on specified level of performance. A commissioning plan will be developed during Title I design to formalize these requirements.

13. Logistic Considerations

Unique logistical considerations are not currently foreseen for the CFN. Delivery of highly technical, one-of-a-kind scientific equipment near the end of the project will require close scrutiny to ensure operational considerations are met. Unique scientific equipment will be installed during an appropriate phase of construction when its protection can be assured.

14. Government-Furnished Property

Use of Government Furnished Property is not foreseen for this project.

15. Government-Furnished Information

The Conceptual Design Report and the Architect/Engineering services Scope of Work will be provided to the A/E to ensure that requirements for Title I and Title II design are clearly understood. This information contains the desired design estimates and construction cost objectives for the CFN.

A complete set of design drawings and specifications will be provided to the general contractor to define the construction contract.

Procurement Specifications will be developed for each major equipment purchase to define the performance and delivery requirements for the instruments.

16. Environmental and Energy Conservation Objectives

All work done on the CFN will be in accordance with applicable federal, state and local guidelines for environmental objectives. An Environmental Evaluation Notification Form was prepared and has resulted in a Categorical Exclusion under NEPA.

The facility will be designed and constructed to meet energy conservation performance standards. The analysis methods to be employed during Titles I and II design phases of the facility shall comply with 10 Code of Federal Regulations (CFR), Part 435 Interim Rule. The A/E firm will implement the specific requirements stipulated by these documents. The basic building design shall include the following components: an Energy Monitoring and Control System, Metering, and energy-efficient Lighting, HVAC, Water Heating, and Power Distribution Systems.

Sustainable building design principles will be applied to the siting, design, and construction of the CFN. Additionally, standard practices, including the use of recycled material, the purchase of energy-efficient and water-efficient equipment, and substitution of less hazardous input materials, will be utilized. Project waste disposal and recycling requirements will be incorporated in construction subcontracts as applicable.

During Title I design, the feasibility and cost impact to achieve Leadership in Energy and Environmental Design (LEEDS) rating for the CFN will be assessed. The highest possible

LEEDS rating will be pursued as feasible within the budget and performance goals of the project

17. Security Considerations

Normal BNL security requirements will be applied to CFN design and construction activity. Access to and from the job site will be controlled by BNL security forces and the BNL Contractor/Vendor management system which includes minimum training requirements, card reader access systems and a contractor database to monitor contractor egress and debarment status. None of the work at the CFN is classified.

18. Contract Administration

Surveillance of the CFN work will be done at three basic levels.

First, the Federal Project Manager will monitor and evaluate BNL project performance against technical, cost, and schedule baselines through monthly project reports, quarterly project performance reviews, and in-depth reviews. Environment, safety and health performance will also be monitored by conducting periodic field observations, using subject matter experts as necessary.

Second, BNL has overall project management responsibility, including monitoring the A/E and General Contractor to ensure that design and construction work is proceeding as planned and providing procurement support, construction support services, and utility tie-ins.

Lastly, the general contractor will have their monitoring systems in place to evaluate the progress of construction contracts in accordance with contract requirements.

19. Other Considerations

There are no other significant considerations associated with the CFN work.

20. Milestones for the Acquisition Cycle

Milestones are identified in Attachment 1.

21. Integrated Project Team

Key members of the Integrated Project Team and their roles and responsibilities are as follows. All members of the team participated in the development of this plan.

Robert Hwang, CFN Director. The CFN Director has responsibility for all operations aspects of the facility, including the direction of the CFN Jumpstart Program. The CFN Director oversees the project through the CFN Project Manager

Michael Schaeffer, CFN Project Manager. The Project Manager has overall authority and responsibility for project execution.

Thomas Vogt/Arnold Moodenbaugh, Technical Construction Coordinators. The Technical Construction Coordinators assist the Project Manager in the performance of his duties, and are responsible for coordination and oversight of technical construction activities including design of technical facilities, instrument specification, procurement, installation and testing.

Martin Fallier, Conventional Construction Manager. Manager is responsible for execution of Conventional Construction including design of conventional facilities, construction management, site information, quality control during design and construction, design reviews, construction progress reviews, and final inspection, test and start-up.

Ove Dyling, Conventional Construction Design Manager. Responsible for design of conventional facilities, oversight of A/E services, Title I, II and III design and design support during construction.

Dave Dale, Technical Procurement Manager. The Technical Procurement Manager has overall responsibility for source selection processes, requests for proposal and contract preparation, contract negotiation and overall contract administration.

Kenneth Koebel, Cost Control Manager. The Cost Control Manager is responsible for monitoring project cost performance, reporting and cost account management in accordance with DOE Order 413.3.

Gloria Diehr, Performance Measurement Administrator. The Performance Measurement Administrator is responsible for monitoring project schedule performance, reporting and schedule management in accordance with DOE Order 413.3.

Steve Hoey, Environmental Safety and Health Coordinator, The ES&H coordinator is responsible for overall ESH oversight of the project including environmental reviews and permitting, hazard analysis, design review for ESH, and safety assessments during construction and testing.

Kristin Bennett, CFN Program Manager, DOE/BES, Provides program guidance for CFN via the Federal Project Manager.

Robert Desmarais and Nand Narain, DOE Brookhaven Area Office (BAO) Federal Project Manager and Deputy Federal Project Manager, respectively. The Federal Project Manager will provide overall project management oversight, issue work authorizations, provide necessary funds via approved financial plans, submit key project documents and critical decisions to DOE, report project progress, and assess BNL project execution performance. The Deputy Federal Project Manager will assist the Federal Project Manager in the performance of his/her duties.

Additional support will be provided by BNL and BAO staff in the areas of environment, safety and health monitoring and oversight; equipment procurement and inspection; budgeting and accounting; and overall quality assurance. Details regarding the Integrated

Project Team and BNL and DOE support functions for this project can be found in the Project Execution Plan.

CONCURRENCES:

Robert Gordon
Contracting Officer, Brookhaven Area Office

Date: _____

Robert Desmarais
DOE/BAO Federal Project Manager

Date: _____

Michael D. Holland
Manager, Brookhaven Area Office

Date: _____

Kristin Bennett
DOE/BES Program Manager

Date: _____

Patricia M. Dehmer
Associate Director for Basic Energy Sciences

Date: _____

Raymond L. Orbach
Director, Office of Science

Date: _____

James A. Rispoli
Director ME-90/for
Office of Management, Budget, and Evaluation

Date: _____

APPROVED:

Robert G. Card
Under Secretary for Energy, Science and Environment

Date: _____

Attachment 1

BNL Center for Functional Nanomaterials Project Schedule

The proposed baseline project schedule includes the following milestones:

NEPA Approval	03/26/02 (A)
CD-0 Approval	06/12/02 (A)
CDR Review and Approval (BNL)	12/31/02 (A)
Approve CD-1 Preliminary Baseline	03/31/03
Technical Construction	
Technical Design Start	08/02/04*
Approve CD-3 Start of Procurement	12/31/04*
Procurement Start	01/03/05
Technical Design Complete	05/31/06*
Procurement Complete	12/29/06
Installation and Testing Start	01/02/07*
Installation and Testing Complete	11/30/07*
CD-4B – Approval	12/31/07*
Conventional Construction	
Start Title I – Preliminary Design	01/02/04*
Complete Title I – Preliminary Design	03/31/04
Title I - Approval	04/30/04
Approve CD-2 Performance Baseline	05/28/04*
Start Title II – Detail Design	06/01/04
Complete Title II Detail Design	10/29/04*
Title II – Approval	11/30/04
Approve CD-3 Start of Construction	12/31/04*
Award Contract	02/28/05
Issue Notice to Proceed	04/01/05
Start Construction	05/02/05*
Complete ORE for Occupancy	11/30/06
Complete Construction	12/29/06*
CD-4A – Approval	01/31/07*

*Major Milestone

(A) Actual